



# **Ameren Illinois 3rd Quarter 2015 Smart Grid Test Bed Report**

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## Executive Summary

Ameren Illinois Company (Ameren Illinois) submits the following Smart Grid Test Bed Quarterly Report in accordance with the Energy Infrastructure Modernization Act (EIMA), 220 ILCS 5/16-108.5 et seq. This report provides updates on the steps Ameren Illinois has taken to implement its test bed plan during the third quarter of 2015. The report includes information on activities Ameren Illinois has undertaken to further develop its “primary” test bed location, discussions with potential test bed customers, and on the testing application process.

## DOE Funding Opportunity Projects

Technology Applications Center (TAC) personnel continue their work on the following DOE funded projects. Work continues on creation of test plans as well as review of each project solutions design.

- **(CODEF) - Collaborative Defense of Transmission and Distribution Protection and Control Devices Against Cyber Attacks**

Primary Investigator – ABB  
Partners – UIUC

This project will advance the state of the art for cyber defense methods for transmission and distribution grid protection and control devices by developing and demonstrating a distributed security domain layer that enables transmission and protection devices to collaboratively defend against cyber-attacks in an IEC 61850 environment.

Ameren Illinois personnel from the Technology Applications Center as well Ameren’s Information Technology Cyber Security department participated in the September 9 - 10, 2015 CODEF project review meeting in Urbana, Illinois. Representatives from each project member organization as well as the DOE project sponsor, Carol Hawk, attended this meeting. Project members were given a tour of the Technology Applications Center on September 9<sup>th</sup> which was followed by a test plan scope and infrastructure requirements discussion to define the Technology Application Center’s test platform requirements. On September 10, 2015, project team members reviewed the University of Illinois – Urbana/Champaign testing results and based on this information, the project team was provided approval by DOE sponsors to move forward to the next project phase.

- **(PBCONF) – Secure Policy-Based Configuration Framework**

Primary Investigator: Electric Power Research Institute (EPRI)

Partners – UIUC, Schweitzer Engineering Laboratories

This project will develop an extensible, policy-based configuration framework to support the secure configuration and remote access of modern and legacy devices from a variety of vendors. The open-source framework will combine a policy engine with a translation engine to address the interoperability challenges of various remote access control methods and provide utilities with a single, organization-wide view of the security configuration for their power delivery devices.

Ameren Illinois received and installed a portion of the components necessary to perform PBCONF node testing. The Ameren Illinois team is presently waiting on other project team members to complete their software coding and preliminary testing of the PBCONF solution. Once these items are completed, Ameren Illinois will assist in development of the overall network communications test platform, including the TAC infrastructure, to enable testing of the PBCONF solution within a larger network communications system.

- **(SDN) – Software-Defined Networking**

Primary Investigator: Schweitzer Engineering Laboratories

Partners – UIUC, Pacific Northwest National Laboratory

SDN allows a programmatic change control platform, which allows the entire network to be managed as a single asset, simplifies the understanding of the network, and enables continuous monitoring in more detail. Control system networks are often more static, while the corporate world is more dynamic.

Ameren Illinois personnel participated in bi-weekly conference calls to stay connected to other project member's activities. TAC personnel provided feedback to a proposed test plan that will be executed at the TAC. TAC personnel are now awaiting delivery of the SDN load flow controller and associated hardware that will be necessary to establish the TAC testing infrastructure for this project. Testing of this technology is now anticipated to occur in the first quarter of 2016.

- **ARMORE) - Applied Resiliency for More Trustworthy Grid Operation**

Primary Investigator – Grid Protection Alliance

Partners – University of Illinois – Urbana/Champaign (UIUC), Pacific Northwest National Laboratory

An open-source system that can perform inspection of network packets and alarms on communication that does not comply with the specified ARMORE policy. ARMORE will be configured to take action to block network traffic based on deep inspection of common substation communications protocols, such as DNP3.

Ameren Illinois did not engage with this Primary Investigator during this reporting period.

### Other Current Test Bed Projects

- Ameren Illinois has completed its testing of LED lights that are comparable to 100 watt sodium vapor high-intensity discharge lamps. This project's final summary report is being created by students at the Ameren Innovation Center and should be available by the end of the 4Q – 2015. TAC personnel are now acquiring LED lights that are comparable to 250 watt sodium vapor high-intensity discharge lamps, to continue the LED light testing process.
- Ameren Illinois received additional vendor supplied Smart Devices that are being validated through Ameren Illinois's Smart Device validation program. As of the end of 3Q – 2015, Ameren Illinois has received four devices from three vendors.
- EPRI's Field demonstrations of the ANSI/CEA-2045 Modular Communication Interface Standard – Four field demonstration devices (Controllable Thermostat, Hot Water Heater, Pool Pump, and Electric Vehicle Supply Charger) are presently being produced by research partner vendors, to enable demand response testing of devices utilizing the modular socket communications platform. Ameren Illinois received and installed a heat pump water heater at the Technology Applications Center which is the first device that this project plans to research. Delivery of the control module to enable demand response testing capability is now anticipated in 4Q – 2105.
- TAC staff continues to work with a Cybersecurity and Compliance Solutions vendor who has been awarded a Department of Energy Grant to develop a patch and update management program for Industrial Control Systems.

### Test Bed Applications

- Ameren Illinois continues to work with an Energy Storage System Integrator for the installation of a battery storage system. This Energy Storage System Integrator has also submitted an interconnection study application to Ameren Illinois. Ameren Illinois engineering and TAC staff are jointly working to process both the TAC and Interconnection study applications. Once the Interconnection study is completed, TAC staff will then work with the vendor to finalize the TAC application work scope and contract.
- Ameren Illinois received an application from an Energy Management solutions provider. The vendor desires to have its newly developed smart thermostat tested with Ameren Illinois' AMI meters to validate that the device correctly communicates via a WiFi communication protocol. During discussions with the vendor, it was determined that the vendor is also developing the device's capability to communicate via a Zigbee communication protocol. Thus this validation

process has been placed on hold until the vendor can provide a device that is capable of communicating through use of both the WiFi and Zigbee communication protocols.

## Test Bed Marketing

During this quarter, TAC staff developed an enhanced process to market the Technology Applications Center to prospective clients. This process includes identifying companies that are classified as startup or innovators within the power industry. The companies are then contacted via a common message that provides information about the Technology Application Centers testing capabilities as well as identifying the prospective company's product that might benefit from being tested through the TAC testing process. This process also included outreach to various university researchers who might be aware of innovative companies in order to increase size of the prospective client list. This enhanced process has provided the following list of prospective testing clients.

- Development of a new fault circuit indicator that harnesses power from the electric distribution system to power the devices operation.
- Development of a testing process for a vendor who manufactures communication network control and contact devices for the electric utility industry.
- Development of a testing process for a vendor that has developed a product that manages the electric distribution systems power factor to improve upon the efficiency of the electric distribution systems operation.
- Development of a testing process for a vendor who manufactures outdoor lighting products. This vendor also believes that they might be able to help market the Technology Applications Center to a large number of their present clients.
- Development of a testing process that a large manufacturer of utility protection devices could utilize to test its products on a live electric distribution system. This manufacturer plans to send representatives from its research and development department to tour the Technology Applications Center in the fourth quarter of 2015.
- Development of a testing process for a manufacturer of energy storage (battery) systems that are interested in researching how their product can affect demand response initiatives.

## Industry Participation

On September 28, 2015, representatives from Ameren Illinois's electric distribution system planning, divisional electric distribution engineering and Technology Applications Center visited an Energy Storage (Battery) site that was recently commissioned on Commonwealth Edison's electric distribution system. Representatives from Commonwealth Edison and the Energy Storage (Battery) site owner provided a tour of this facility that allowed participants to learn about the installations

components and ask questions about the engineering analyses that Commonwealth Edison performed, to enable this solutions installation on the Commonwealth Edison electric distribution system. Learnings from this visit will be utilized by Ameren Illinois employees as we assess the TAC application and Interconnection study applications from the Energy Storage System Integrator identified by the first bullet in the Test Bed Application section above.

### Test Bed Tours

- On July 29, 2015, TAC staff conducted a tour of the TAC facility for two representatives of Ameren's corporate planning department. The attendees were interested in how the Technology Applications Center might be further utilized to assist in research efforts.
- On September 9, 2015, TAC staff provided Mr. John Regan - Energy Foundry a tour of the TAC facility.
- On September 15, 2015, TAC staff provided a tour of the TAC facility for two Ameren Vice-Presidents to educate them on the Technology Applications Center testing capabilities as well as to allow them to provide insight on how the TAC might be utilized for future electric distribution system research.
- On September 18, 2015, TAC staff provided a tour of the TAC facility to 18 Ameren Illinois employees who work in the regulatory, gas engineering, & customer service departments.

### Smart Grid Test Bed Plan Success

Ameren Illinois' commitment to the successful implementation of its Smart Grid Test Bed plan is strong. However, as set forth above, Ameren Illinois reserves the right to modify, amend or alter this plan, as necessary and consistent with the law, to meet the requirements and objectives of the EIMA and other related provisions. Additionally, Ameren Illinois reserves its right to terminate this plan.